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**Marine Casualty
Investigations**

**Enquêtes sur les
accidents maritimes**

**Investigation
Report
to the Minister
pursuant
to sections
542 or 545
of the
Canada
Shipping Act**

**Rapport
d'investigation
au Ministre
conformément
aux articles 542
ou 545 de la Loi
sur la marine
marchande
du Canada**

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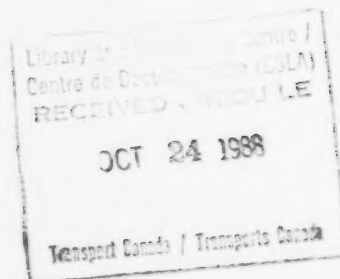
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Ce rapport est aussi disponible en français.

INVESTIGATION REPORT INTO THE
CIRCUMSTANCES ATTENDING THE GROUNDING
OF THE PHILIPPINE VESSEL "TESTAROSSA"
WHILST APPROACHING THE BERTH AT
PORT-CARTIER, QUEBEC,
ON MARCH 23, 1986.

REPORT No. 459



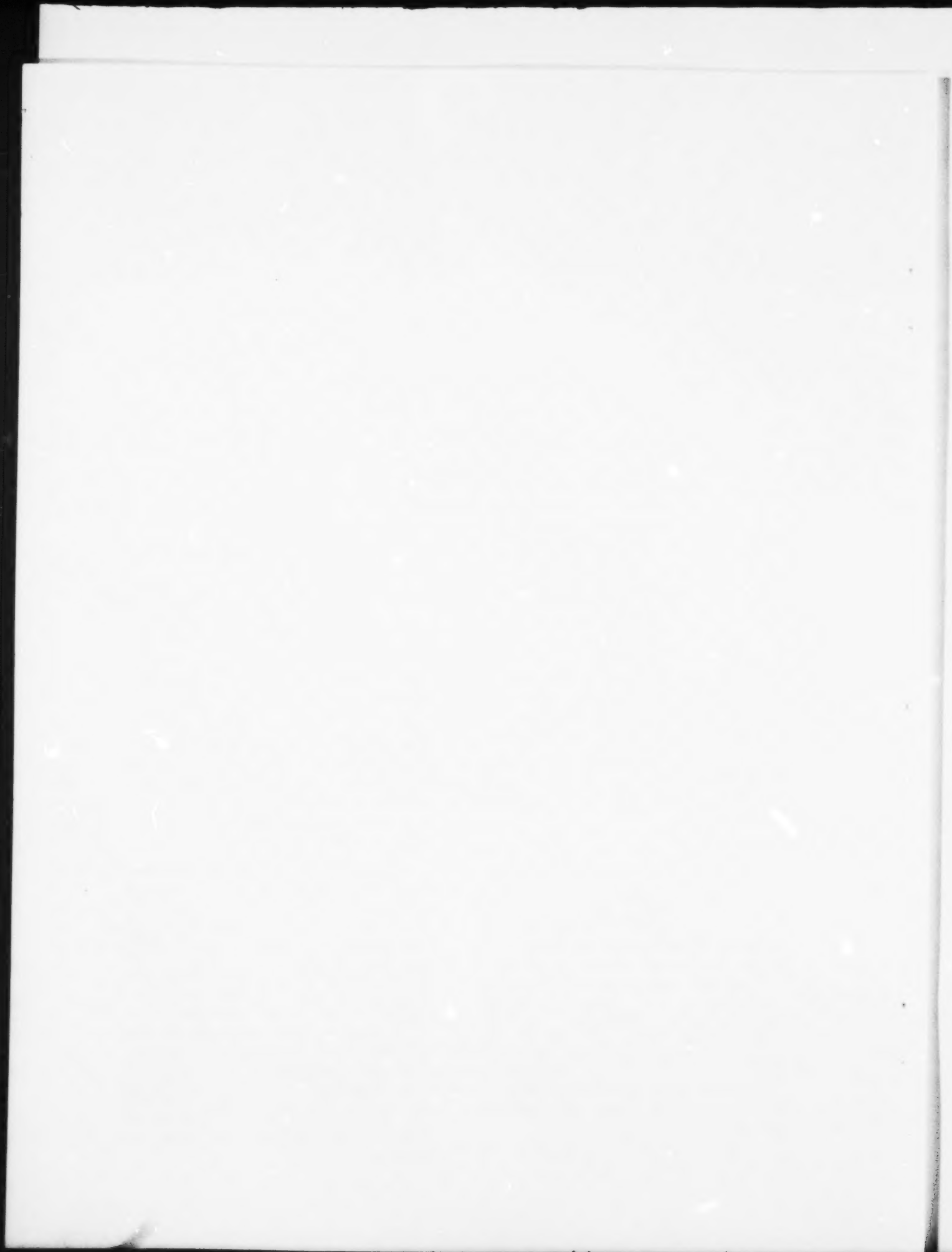
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**INVESTIGATION REPORT INTO THE CIRCUMSTANCES ATTENDING
THE GROUNDING OF THE PHILIPPINE VESSEL "TESTAROSSA" WHILST
APPROACHING THE BERTH AT PORT-CARTIER, QUEBEC,
ON MARCH 23, 1986.**

Particulars of Vessel

Name	"TESTAROSSA" (see note) ex "GOLDEAN MARINER"
Official Number	228087
Port of Registry	Manila, Philippines
Call Sign	DZCS
Gross Tonnage	66,903.33
Net Tonnage	36,033.18
Length	260.89 m
Breadth	40.60 m
Depth	24 m
Draught (maximum)	16 m
Draught (at time of incident)	F : 8.60 m A : 12.27 m
Type	Bulk carrier
Built	1970, MHI Ltd. Hiroshima Shipyard, Japan
Propulsion	One (1) Mitsubishi UE 8 cylinder diesel engine, type 8 UEC85/ 180D, 21,600 b.h.p., driving a fixed pitch propeller, engine- room-controlled.
Cargo	Nil
Ballast	76,000 t sea water
Crew	30
Classification	N.K., Japan
Owner	Golden Ocean Ltd. London, U.K.

Charterer	N.V. Bocimar S.A. Antwerp, Belgium
Agent	Compagnie Minière Québec Cartier

NOTE: "TESTAROSSA" is the name of the vessel as recorded on her certificates and as painted on the hull. However, the spelling "TESTAROSA" is listed in Lloyd's Register.

Navigating Equipment

Radar	two (2)
Direction Finder	one (1)
Echo Sounder	one (1)
Sat-Nav	one (1)
Loran C	one (1)
VHF	one (1) radio (very high frequency)
MF	one (1) radio (medium frequency)
Gyro Compass	one (1)
Magnetic Compass	one (1)
Autopilot	one (1)

Description of Vessel

The "TESTAROSSA" is a typical nine-hold, nine hatch, deep-sea bulk carrier with engine-room, bridge and accommodation located aft. She has a summer deadweight of 115,721 tonnes and a range of 25,100 nautical miles at a speed of 14.8 knots. The "TESTAROSSA" is not fitted with a bow thruster.

The vessel's Cargo Ship Safety Construction certificate, Cargo Ship Safety Equipment certificate, Cargo Ship Safety Radiotelegraphy certificate and Load Line certificate, were all valid.

- NOTE:**
1. All times in this report are expressed in Eastern Standard Time (UTC minus five hours).
 2. A glossary of abbreviations and terms can be found following the Findings in this report.

Background

On March 22, 1986, the "TESTAROSSA" arrived in ballast off Port-Cartier, Quebec from West Germany. The following day while approaching the berth at section No. 1, where the vessel was to load a cargo of iron ore destined for France, the main engine failed to respond when astern power was ordered. The two tugs assisting the vessel broke their towlines while trying to take the way off the vessel. The bow of the vessel struck the rocky bottom in the north-east corner of the harbour. Severe damage was sustained by the bulbous bow in this accident but the harbour facilities were not affected.

There were no injuries nor was there any pollution as a result of this incident.

Narrative

In late March 1986, the "TESTAROSSA", was inbound to Port Cartier, Quebec from Brunsbuttel, West Germany, to load a cargo of iron ore for a French discharge port.

The vessel was in ballast with about 76,000 tonnes of sea water on board and, although she had taken an ice advisor on board on reaching the Canadian coast, the crossing of the Gulf of St. Lawrence, through the ice, was difficult and the vessel had to stop several times because of ice accretion in the sea water inlet. On one occasion, the vessel was beset in the ice, and while waiting for more favourable conditions, the main engine was stopped and the chief engineer took this opportunity to replace, with re-built units, six (6) exhaust valves on the main engine's Nos 2 and 3 cylinders.

The vessel finally arrived off Port-Cartier during the evening of March 22, 1986. In a radio conversation with the agent, the master was advised that another vessel was presently occupying the berth. He was informed that his vessel would probably dock the next day.

The master decided to lay off Port-Cartier harbour instead of anchoring. The main engine was used a few times, turning ahead, to maintain the vessel's position, about

ten miles off the harbour entrance.

Finally at about 2236 the following day, March 23, 1986, the harbour pilot was transferred from the tug "VACHON" to the "TESTAROSSA" as she lay 4 miles to the east of the buoy off the harbour entrance.

Upon arriving on the bridge, the pilot requested that the main engine be put to 'half ahead' and also inquired about the particulars and draught of the vessel. At 2246, the speed was reduced to 'slow ahead' and at 2258 to 'dead slow ahead'.

The pilot was accompanied by an apprentice who was in fact master of one of the local tugs. The apprentice had been accompanying the pilots for some time in order to learn the profession with a view to becoming a pilot sometime in the future.

The following persons were on the bridge at this time; the master, the officer on watch, the wheelsman and the ice advisor, who, not being involved at this stage with the navigation of the vessel, sat at the back of the wheelhouse.

The approach to the buoy off the harbour entrance was uneventful. The pilot familiarised himself with the disposition of all the controls and the equipment such as the rudder-angle indicator and the tachometer.

It was at this time that the master warned the pilot about entering the harbour at too great a speed since the vessel was sixteen years old and the main engine when running astern did not have its original efficiency.

As the "TESTAROSSA" was making the turn to line up with the leading lights, at about 2308, the pilot decided to test the main engine, and ordered it stopped, followed by 'slow astern' and 'half astern'. The response from the engine was good and the revolutions climbed to about 50 r.p.m. The pilot was satisfied and asked that the engine be stopped.

The pilot had requested the tugs to make fast the towlines from the "TESTAROSSA" early in the approach because he anticipated that the procedure would take some time. He noticed that the vessel seemed to be moving too fast and asked the forward tug for an estimate of the speed. When he was told that the speed was about 4 to 4.5 knots the pilot asked for 'half astern'. At 2311 the engine responded quickly and 40 to 50 r.p.m. astern were obtained. At 2313 the engine was stopped and at 2318 it was put on 'dead slow

ahead' for about one minute, after which it was stopped.

The vessel was well in the middle of the channel. The sky was clear and the wind was blowing at ten knots from the south-west, from astern of the "TESTAROSSA".

The vessel continued for a distance of about 0.75 of a mile in which time about eleven minutes elapsed. It was about 2330 when the first dolphin to the south-west of the harbour entrance was abeam of the vessel, amidships. It is about this time that the pilot usually begins the manoeuvre to stop the vessel.

The vessel was in the centre of the channel but showed a tendency to veer to starboard. The pilot stepped out onto the wing of the bridge and estimated that the vessel was still making about three knots and which was acceptable. He asked for 'half-astern'. He could feel a vibration and asked the tug "BROCHU", which was made fast on the starboard quarter, to pull in order to keep the stern in the channel.

A little later, the apprentice who had boarded with the pilot, informed him that the revolutions were turning at only ten (10) r.p.m. astern. The pilot made a quick check and noted that the needle was close to zero.

He asked the tugs to arrest the forward movement in order to stop the vessel because he realized something was wrong with the engine. Subsequently he asked the master for 'full-astern'.

When the vessel's bridge came abeam of the second dolphin on the west side of the entrance, the pilot noted that the "BROCHU" was pulling aft and that, at the forward end, the "VACHON" was ready to start towing. The pilot asked the "VACHON" to also pull to starboard because the "TESTAROSSA" was close to the 'nose of the harbour' (see plan).

Before the vessel's bridge was abeam of the 'nose of the harbour', both towlines to the tug "BROCHU" had parted. The pilot ordered that the anchor be let go with three (3) shackles and shouted two or three times to the master for full astern speed but the tachometer needle only oscillated and finally the main engine stopped completely.

When the bow of the vessel was only 60 m from the end dolphin of the No. 4 dock, the anchor was let go, but as it was dropped it broke one of the towlines to the "VACHON". The tug was then only able to exert a portion of her bollard pull as she tried to pull the bow of the "TESTAROSSA" to

starboard so that the vessel would miss the dock.

Finally the second towline to the "VACHON" parted. Nothing could now stop the vessel as she was still making way through the water at an approximate speed of two knots. There was still some slack in the anchor cable and it proved to be of no use in slowing down the vessel. The "TESTAROSSA" missed the end of No. 4 dock and ran into the rocks which form the north-east boundary of the harbour. It was approximately 2338.

The main engine had used up all the starting air and could not be used again over the period of this casualty.

The tug "BROCHU" had one of the broken towlines entangled in the blades of her (Voith-Schneider) propulsion system, and the "VACHON" moved from forward to amidships to push the "TESTAROSSA" towards the dock.

The "BROCHU" was able to clear her blades of the broken towline and two other towlines were given to her by the vessel. The "VACHON" was likewise resecured and the vessel was docked by the tugs at her loading berth, section No. 1.

An inspection by divers revealed that the bulbous bow had sustained severe damage. There were no signs of pollution at the time of, or after, the accident. No injuries were reported.

Analysis

1. Weather conditions

At the time of the accident, the skies were clear, the wind was from the south-west at ten (10) knots with one metre seas.

2. Particulars of harbour

The port of Port-Cartier is an artificial harbour excavated from solid rock. The depth of water inside the harbour is 15.24 m (50 ft). From the sea, the entrance channel has a depth of 16.61 m (54.5 ft) and a width of 60.96 m (200 ft) on each side of the leading line. For 91.44 m (300 ft) outside the channel on each side, there is a depth of 12.19 m (40 ft) of water.

In order not to lose steerage way when entering the harbour, vessels must maintain a minimum speed. A speed of four knots is considered normal by local pilots.

Once inside, the vessels have a very short distance within which to stop.

3. Efficiency of the tugs

The two identical tugs "BROCHU" and "VACHON" were built in 1973. Each is propelled by twin diesel engines producing a total output of 3,600 b.h.p. driving two 'Voith-Schneider' propellers. This system permits great manoeuvrability and makes the tugs suitable to operate efficiently in restricted waters; the angle of the tug to the vessel has no bearing on the pulling or pushing capacity.

4. Procedure in making tugs fast to vessels

The current practice in Port-Cartier calls for the vessel to use her mooring lines as towlines for the tugs. Usually two mooring lines are secured to each tug. The breaking strength of these mooring lines represents the limit in bollard pull that a tug may exert.

The "TESTAROSSA" had passed to each tug two polypropylene mooring lines of 25.4 cm (10 in) circumference. These parted before the tugs had a chance to exert even 50% of their potential bollard pull.

5. Dropping the anchor

As usual, the pilot had asked that the starboard anchor be cleared for letting go while the vessel was approaching the entrance to the harbour. When the bridge of the "TESTAROSSA" was abreast of the 'nose of the harbour' the pilot ordered that the starboard anchor be let go with three shackles of chain. This order was retransmitted forward by the master but it seems there was a delay between the order and the time when the anchor was actually let go. The bow of the "TESTAROSSA" was only 60 m from the end dolphin to the east of dock No. 4, when the anchor was dropped. During its fall, the anchor broke one of the two towlines made fast to the tug "VACHON".

6. Breaking strength of the towlines and bollard pull of the tugs

Information concerning the breaking strength of mooring lines was extracted from the Salvors Handbook. According to this manual, a polypropylene mooring line with a circumference of 25.4 cm (10 in) will have a

minimum breaking strength of 57.5 tons (2000-lb ton) when new, dry and clean.

It mentions that if a rope is stressed to its breaking strength, it should be considered damaged. Also, the bending radius affects the breaking strength of the rope and it should not be less than three (3) times the rope circumference. The towlines were made fast to the mooring bitts on the deck of the "TESTAROSSA" and were led through fairleads. The bending radius of the towlines at these leads is not known but it appears that the lines parted at that point.

Based on the data furnished in the above-mentioned manual, and considering that the tug has a bollard pull of 50 tonnes, the use of two towlines of the type used by the "TESTAROSSA", should have been adequate, providing that they were subjected to equal tension and were in good condition.

Other factors may cause an unexpected increase in tension on the towlines such as the wave height or a sudden increase in bollard pull by the tugs.

No tests were made on the broken mooring lines in order to determine their breaking strength. After the accident they measured only 24.1 cm in circumference.

7. Speed of main engine

According to instructions posted in the wheel-house of the "TESTAROSSA", the manoeuvring speeds for the main engine are as follows:

full	- 75 r.p.m.
half	- 65 r.p.m.
slow	- 55 r.p.m.
dead slow	- 35 r.p.m.

There was no explanation from the crew as to why the main engine would not operate properly in the astern mode.

When the control lever was pushed to maximum speed, the engine speed fluctuated and when the chief engineer was in the vicinity of the main engine he noticed that the fuel rack for the fuel pumps was indicating maximum flow. He detected nothing irregular except for the fact that the engine slowed and seemed to be choking.

8. Exhaust valves

It seems that for economical reasons, the main engine was not operated at its maximum rated output. Hence, the exhaust valves had a tendency to foul rapidly.

On leaving Brunsbittel in Germany, a main engine exhaust valve jammed in the open position.

When the vessel was beset in the ice in the Gulf of St. Lawrence, the main engine was stopped and the chief engineer took advantage of that opportunity to replace six (6) exhaust valves. Also when the vessel was docked in Port Cartier, the engineers cleaned and replaced some other exhaust valves on the main engine.

It should be emphasized that the vessel was operated at 'dead slow speed' during the 24 hour wait before proceeding into the harbour at Port-Cartier. Operating an engine under those conditions would cause fouling.

9. General condition of engine-room

The state of maintenance in the engine-room would indicate that operating costs were kept to a bare minimum. For example, the main engine controls on the bridge could not be used because they were out of order and the automatic control on the fuel heater also could not be used. This automatic control is steam powered and it was necessary to manually activate the by-pass valve to control the temperature.

10. Fuel heater

After the accident, it was noticed that the by-pass valve which was used to control the intake of steam to the fuel heater was not properly closed and that steam seemed to be leaking. The thermometer which measured the temperature of the fuel at the outlet of the fuel heater was indicating 110°C.

Ordinarily, this heater is used only to warm heavy oil and is equipped with an audible alarm and a warning light that comes on at the panel indicating to the engineer that the temperature of the fuel has reached 120°C.

When the vessel switches to marine diesel oil for manoeuvring, the steam which feeds the fuel heater is shut off; diesel oil does not need to be warmed up. The alarm is then disconnected and the temperature of the

fuel is not monitored.

11. Duties of engineers during manoeuvring

Usually, and this was the case at the time of the accident, the second engineer carried out the manoeuvres ordered by the bridge while the chief engineer stood by. The third engineer checked the donkey boiler and opened or closed, as required, the steam feed to the fuel heater.

It was reported that the main engine had been running on marine diesel oil since 1955 on the day preceeding the accident.

12. Gasification of the marine diesel oil

Since the by-pass valve controlling the steam which fed the fuel heater was not completely shut and the main engine, which was running on diesel fuel, had been stopped for eleven minutes before being run astern, it was thought that the diesel fuel may have gasified and thus prevented the engine from running normally.

Two samples of the fuel used on board, one of the diesel fuel, the other of the heavy oil, were sent to the Fuels and Lubricants Laboratory in Ottawa for analysis and tests.

The heavy oil 'bunker' sample was contaminated with water and could not be analyzed. This heavy oil had been taken from the drain cock of the daily service tank and it is not unusual that it should contain some water.

The marine diesel oil sample was taken from the first filter on the settling tank line. The analysis showed that this fuel had similar specifications to the diesel fuel taken aboard in Rotterdam. Therefore it is most unlikely that it was mixed with another product.

On the "TESTAROSSA", the fuel feed pumps maintained a pressure of 5 kg/cm².

The report from the laboratory states that the marine diesel fuel could not gasify when subjected to a 5kg/cm² pressure unless the fuel had reached a very high temperature, that is more than 260°C (500°F).

The main engine would have been running on marine diesel oil for more than 24 hours before the accident. During that period, the engine was stopped for long intervals

and on several occasions. If overheating of the fuel had occurred, a problem due to gasification would have materialized long before entering the harbour.

However, there was always a possibility that the pressure in the line feeding the diesel fuel had dropped, making it possible for the fuel to gasify in the pipes, but this hypothesis could not be corroborated.

An examination of the engineer's log books revealed that there was a tendency to run the main engine on heavy oil as often as possible.

During a visit to the engine-room by the surveyors after the accident, a small amount of water was found in one of the fuel filters.

While at Port-Cartier, the fuel injection valves of five (5) of the eight (8) cylinders of the main engine were replaced by re-built units.

13. Difficulty in starting the main engine

The "TESTAROSSA" commenced loading after the necessary repairs to the bulbous bow were completed. While manoeuvring to leave the harbour, the main engine refused to start. The tugs had to tow the vessel to an anchorage where it was found that the air distribution valve on the starting-air supply was out of order.

However this problem was completely different from the one experienced when entering the harbour. At that time the engine ran but stopped and never restarted. On sailing, the engine could not even be turned with the starting-air.

14. Qualifications and experience of personnel aboard the "TESTAROSSA"

The master of the "TESTAROSSA" has 37 years of sea experience of which 15 years are as master. He joined the vessel in February 1986. He holds a certificate of competency as master foreign-going, unlimited tonnage, issued by the Republic of the Philippines in September 1974.

The third officer of the "TESTAROSSA" who was on watch at the time of the accident, has 7 years of sea experience of which one is as third officer. He has been on board this vessel since September 1984. He holds a

certificate of competency as third officer foreign-going for vessels of unlimited tonnage issued by the Republic of the Philippines in January 1982.

The chief engineer of the "TESTAROSSA" has 20 years of sea experience of which 2 are as chief engineer. He has been on board this vessel since January 1986, but he had worked on board previously. He holds a certificate of competency as a first class marine engineer issued by the Republic of the Philippines in September 1982. He also holds a Panamanian motor certificate of competency as chief engineer issued in February 1984.

The second engineer of the "TESTAROSSA" has 28 years of sea experience. He has been on board since September 1985. He holds a certificate of competency as a second class marine engineer valid for all vessels in all waters. This certificate was issued by the Republic of the Philippines in August 1976.

15. Qualifications and experience of the pilot and the masters on board the tugs

The harbour pilot at the time of the incident, was employed by the Compagnie Minière Québec Cartier. He has about 25 years of sea experience. He holds a Canadian certificate of competency as master of a tug and also as first mate of a home-trade steamship. He has been a pilot in the harbour of Port-Cartier for about one (1) year.

The master of the tug "BROCHU" has 28 years of sea experience of which 12 years are as master on this tug. He holds a Canadian certificate of competency as master of a home-trade tug issued in April 1968.

The master of the tug "VACHON" has 26 years of sea experience of which 14 years are as master of tugs in the harbour of Port-Cartier. He holds a Canadian certificate of competency as master of an inland waters tug issued in February 1969.

16. Damage to vessel

The bulbous bow of the "TESTAROSSA" was severely damaged. According to the report of the divers who inspected the hull of the vessel, the damaged section measured about 5.5 m in height and extended a few metres aft from forward.

The temporary repairs that were made on location before

loading, cost in excess of \$100,000.

Findings

Assisted by two tugs and with a harbour pilot on board, the Philippine vessel "TESTAROSSA", while entering the harbour of Port-Cartier, was unable to arrest her headway and she struck bottom in the north-east corner of the harbour causing severe damage to her bulbous bow. The exact reason for the main engine stalling cannot be explained, however, it appears that the following factors contributed to the accident:

- when it was required to run astern, the main engine, after running for a short period of time, slowed down and finally stalled. The engineers were unable to restart it;
- the efforts of the tugs to slow down the vessel were limited by the breaking strength of the towlines; these lines parted when the tugs had only exerted about half of their total capacity to pull;
- the starboard anchor of the "TESTAROSSA", which was dropped in an attempt to slow the vessel, was let go too late and was therefore not effective; and
- when let go, the anchor broke one of the towlines to the tug "VACHON" and in so doing, limited the bollard pull which that tug could effectively use.

Other findings

It was indicated to the pilot shortly after boarding that the master did not have much confidence in the main engine when it was running astern. Tests carried out with the main engine going astern about one and a half miles before the harbour entrance proved satisfactory.

It is quite possible that, had the towlines not parted, the "TESTAROSSA" would have been stopped and moored without incident.

The overall condition of the machinery on board the "TESTAROSSA" showed evidence of neglect.

OTTAWA, ONTARIO
JANUARY, 1987.

Glossary

b.h.p.	Brake horsepower
By-pass valve	Screw down valve on a by-pass line
Harbour pilot	A pilot, who, because of his local knowledge, conducts the mooring of vessels in a particular harbour
Ice Advisor	A certificated deck officer experienced in ice navigation
Nose of harbour	A name given to the extension of dock No. 3 in the harbour of Port-Cartier where it protrudes into the turning basin
Shackle	A length of anchor chain measuring 15 fathoms (90 ft, 27.4 m)
UTC	Co-ordinated Universal time
(Voith-Schneider)	Patent propeller, set into the bottom of the hull, which consists of a number of blades rotating about a vertical axis. The propeller can be used to steer through 360° in addition to being used for propulsion.

ANNEX I

APPENDICE I

FIG. 4.1 RELATIVE PROPERTIES OF FIBER ROPES

PROPERTY	MANILA	NYLON	DACRON	POLYPROPYLENE
STRENGTH/WEIGHT RATIO (AVG)	1.0	2.84	2.03	2.32
RELATIVE IMPACT RESISTANCE	1.0	8.6	4.0	5.2
WATER ABSORPTION, %	25.0	4.5	1.5	0
SPECIFIC GRAVITY	1.38	1.14	1.38	.90
RESISTANCE TO ABRASION	FAIR	GOOD	BEST	FAIR

FIG. 4-2 FIBER ROPE; WEIGHT (W) & BREAKING STRENGTH (BS)

SIZE		MANILA		NYLON		DACRON		POLYPROPYLENE	
IN	CM	W	BS	W	BS	W	BS	W	BS
Diameter :									
1/2	1.27	7.5	1.3	6.1	2.8	7.7	2.5	4.8	1.9
9/16	1.43	10.4	1.7	8.0	3.5	9.5	3.3	6.3	2.4
5/8	1.59	13.3	2.2	10.3	4.2	12.5	4.0	8.3	3.0
3/4	1.91	16.7	2.7	13.9	5.8	16.6	5.5	11.0	3.5
7/8	2.22	22.5	3.9	20.0	8.0	24.2	7.8	15.7	5.5

Circumference:									
3	7.6	27.0	4.5	24.5	11.0	28.5	9.3	19.2	6.5
3 1/4	8.3	31.3	5.3	29.0	13.0	33.5	10.8	22.5	7.4
3 1/2	8.9	36.0	6.0	33.3	14.3	40.0	12.5	26.3	8.3
3 3/4	9.5	41.8	6.8	38.4	16.5	44.0	14.0	30.3	9.8
4	10.2	48.0	7.5	43.5	18.8	50.0	15.5	34.2	10.8
4 1/2	11.4	60.0	9.3	55.5	23.0	63.0	19.5	43.8	13.0
5	12.7	74.4	11.3	66.5	28.5	77.0	24.0	52.5	16.0
5 1/2	14.0	89.5	13.3	80.0	34.0	94.0	28.5	63.2	19.0
6	15.2	108.0	15.5	100.0	40.5	111.0	34.0	79.3	22.0
6 1/2	16.5	125.0	18.0	111.0	45.0	130.0	38.5	91.0	25.0
7	17.8	146.0	20.5	141.0	55.0	152.0	44.0	111.0	30.0
7 1/2	19.1	167.0	23.3	162.0	62.0	175.0	50.0	127.0	34.0
8	20.3	191.0	26.0	182.0	68.5	200.0	55.0	142.0	37.5
9	22.9	242.0	32.0	232.0	85.0	250.0	70.0	183.0	47.0
10	25.4	299.0	38.5	294.0	100.0	303.0	82.5	232.0	57.5
11	28.0	367.0	45.5	350.0	120.0	375.0	100.0	272.0	69.0
12	30.5	436.0	52.5	416.0	140.0	445.0	115.0	325.0	82.0

NOTE: WEIGHT SHOWN IN POUNDS PER 100 FEET: BREAKING STRENGTH IN TONS OF 2000 POUNDS.

ST. LAWRENCE/GOLFE SAINT-LAURENT

1:3 500 000 (22° 30')

DEPTHS IN METRES

HEIGHTS IN METRES

Mercator Projection

PROFONDEURS EN MÈTRES

HAUTEURS EN MÈTRES

Projection Mercator

Imagined by the Canadian Hydrographic Service from information to 1875.

Magnetic Variation Curves are for 1980 epoch. Figures in parentheses indicate the annual change.

UNCONFIRMED DATA: Reported but unconfirmed depths. Dangers are indicated by an encircling dotted line.

International boundaries as shown are approximate.

Illustrating the Fishing Zones of Canada as amended by Orders-in-Council, P.C. 1871-368 and 1877-1 as amended by P.C. 1878-184.

NOTE

FISHING ZONE 4 DOES NOT INCLUDE CANADA'S FISHING 12 MILE TERRITORIAL SEA.

Redigée par le Service hydrographique du Canada d'information jusqu'à 1875.

Les courbes de déclinaison magnétique correspondent à l'époque 1980. Les chiffres entre parenthèses représentent la valeur de la variation annuelle.

DONNÉES DOUTEUSES: Des profondeurs et des dangers signalés mais non confirmés sont indiqués par un encerclement pointillé.

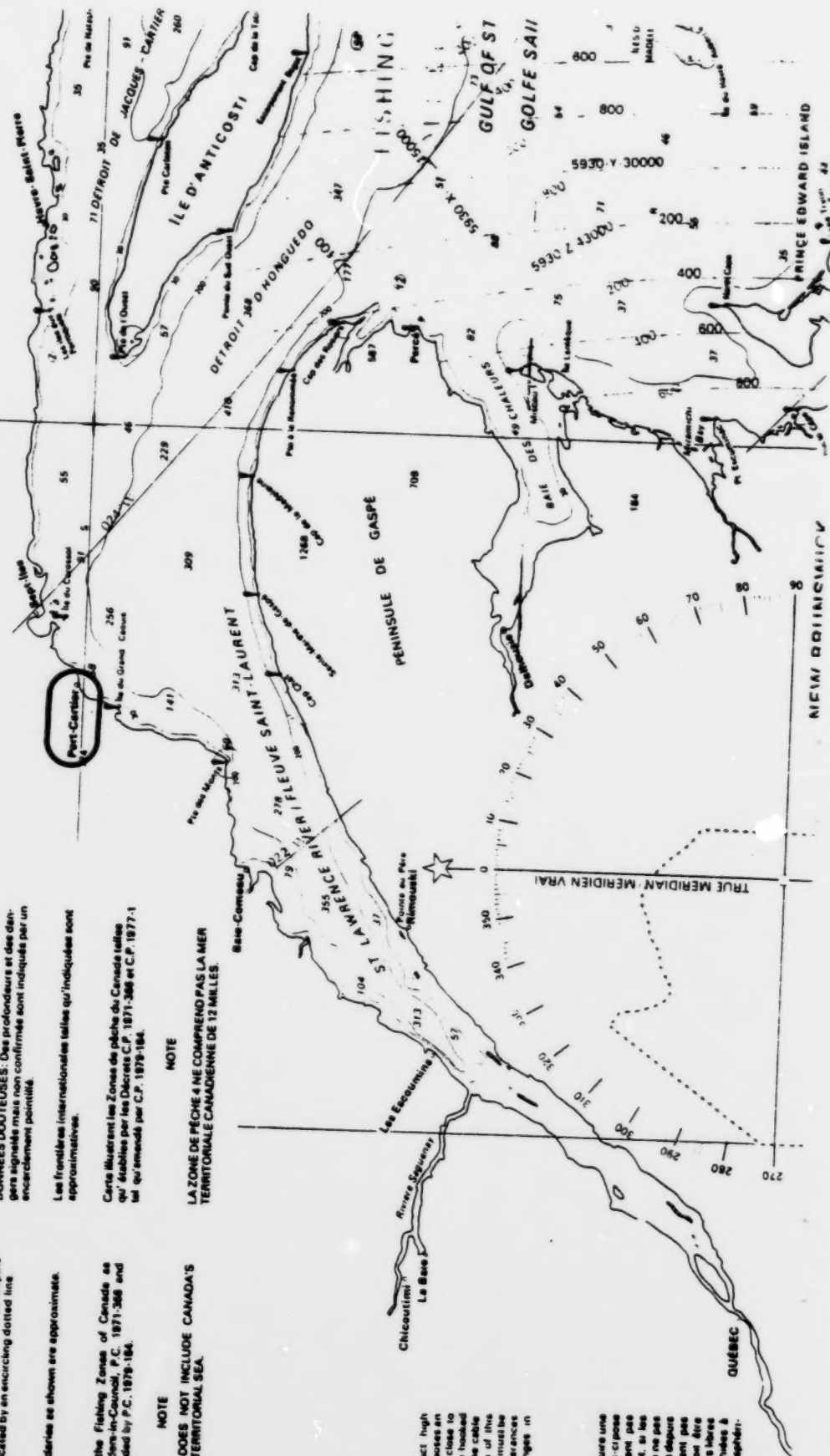
Les frontières internationales telles qu'indiquées sont approximatives.

Carte illustrant les Zones de pêche du Canada telles qu'établies par les Décrets C.P. 1871-368 et C.P. 1877-1 tel qu'amendé par C.P. 1878-184.

NOTE

LA ZONE DE PÊCHE 4 NE COMPREND PAS LA MER TERRITORIALE CANADIENNE DE 12 MILES.

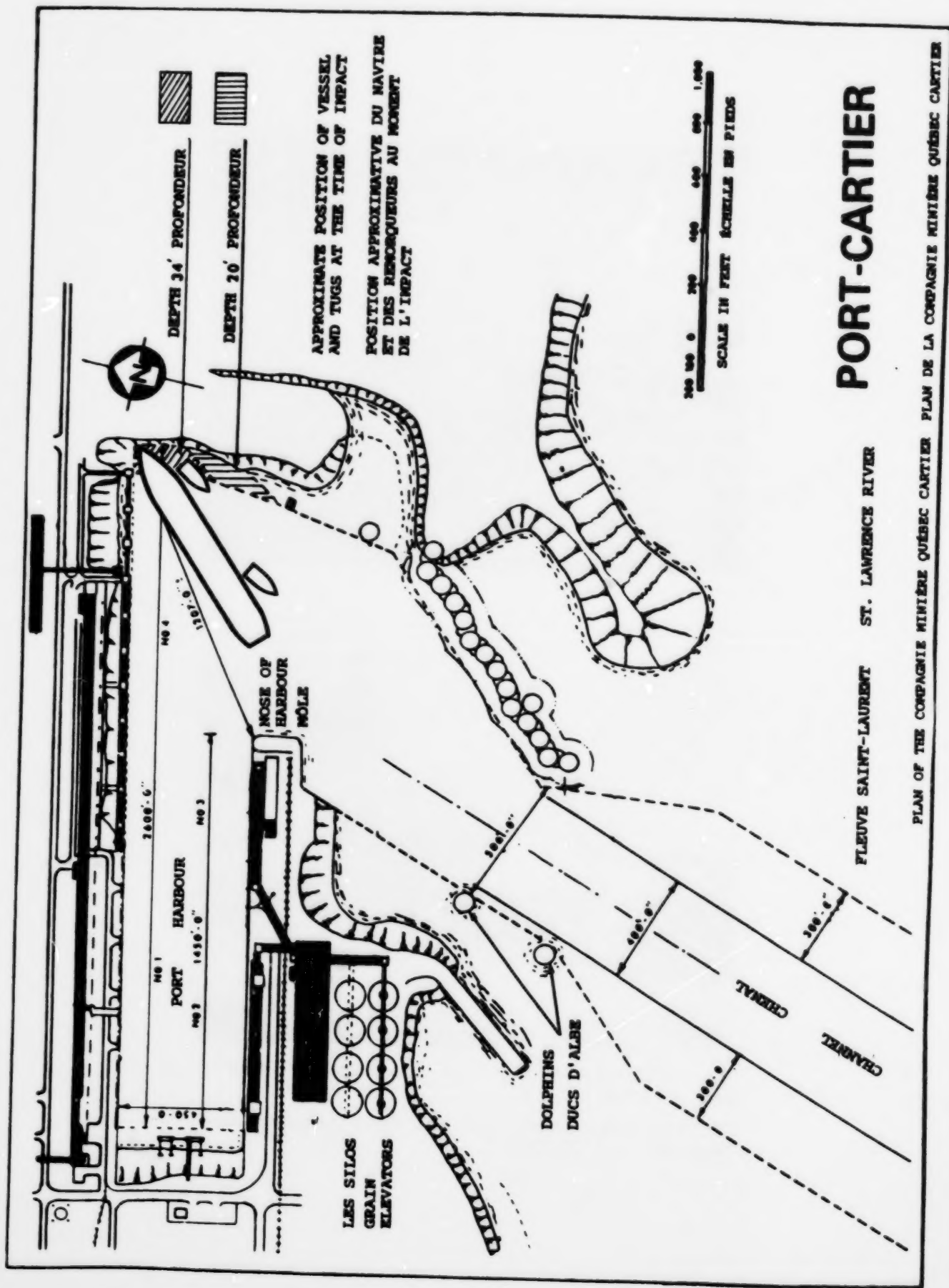
QUÉBEC

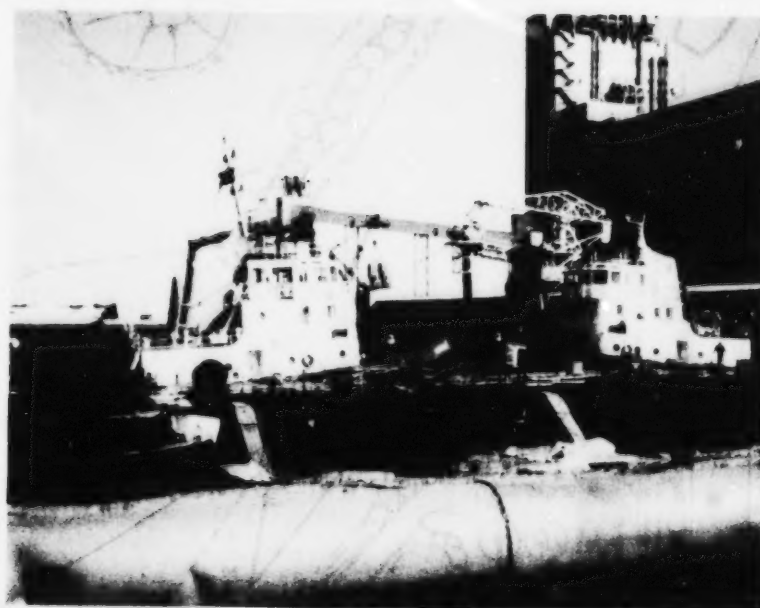
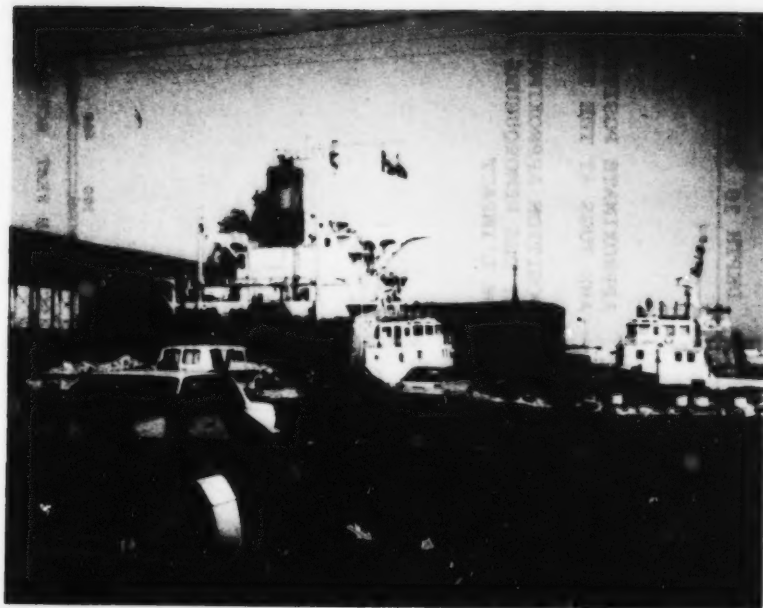


ANCHORS may conduct high proximity to these points and should not anchor close to them unless the cable is not to sever the cable. The date of publication of this chart is not sufficient to ensure that the cable is not severed. Actual clearance must be taken due to changes in water levels.

REMARKS

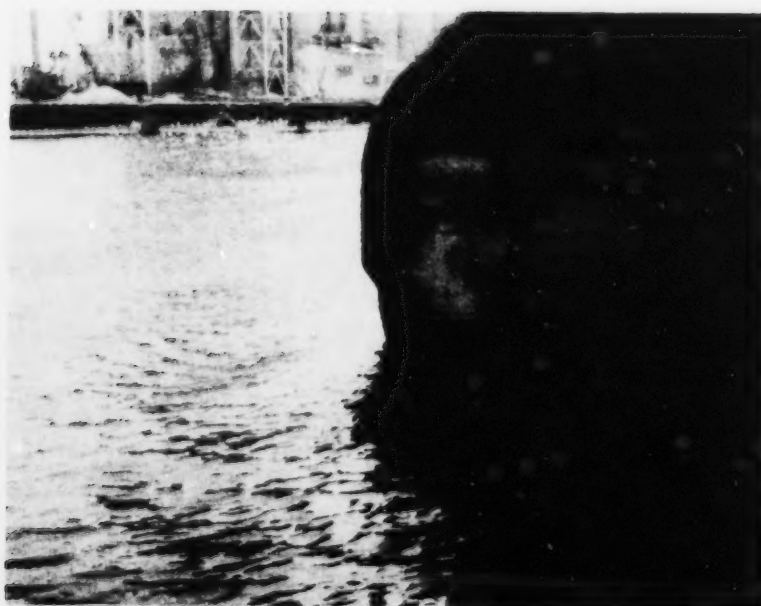
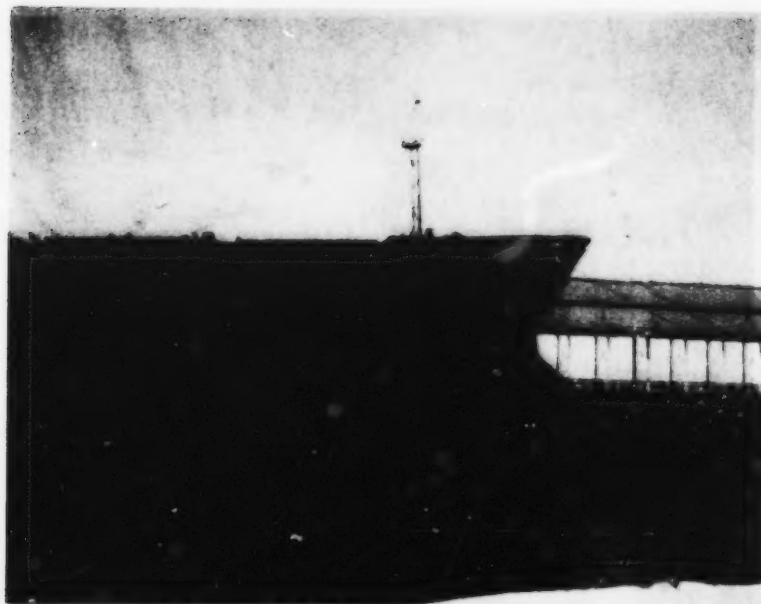
Les profondeurs indiquées sont pour l'époque 1980. Les chiffres entre parenthèses indiquent la valeur de la variation annuelle. Les hauteurs indiquées sont pour l'époque 1980. Les chiffres entre parenthèses indiquent la valeur de la variation annuelle.





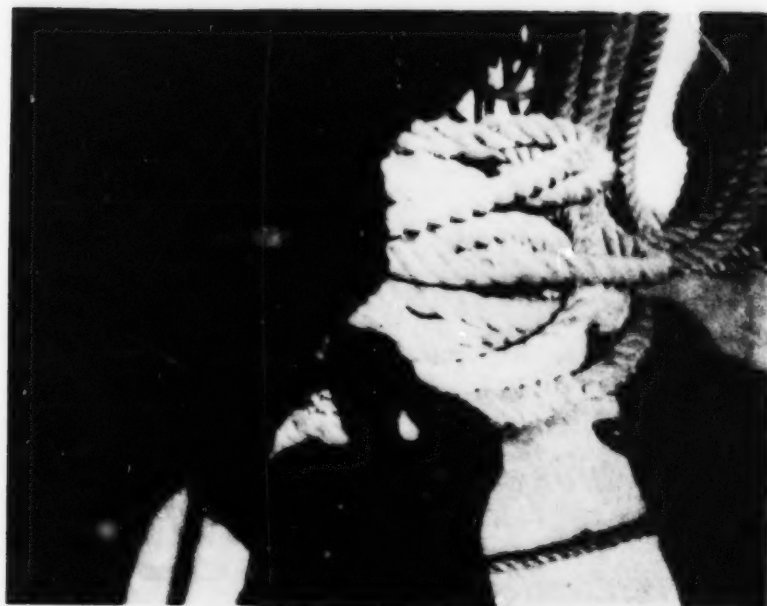
The "TESTAROSSA" and the two tugs "BROCHU" and "VACHON".

"TESTAROSSA" ainsi que les deux remorqueurs "BROCHU" et "VACHON".



"TESTAROSSA" - some of the damage to the bulbous bow can be seen.

"TESTAROSSA" - on peut voir une partie des avaries à son bulbe d'étrave.



Sections of the two mooring lines by which the tug "VACHON" was secured to the "TESTAROSSA".

Une partie des deux amarres par lesquelles le remorqueur "VACHON" était amarré au "TESTAROSSA".



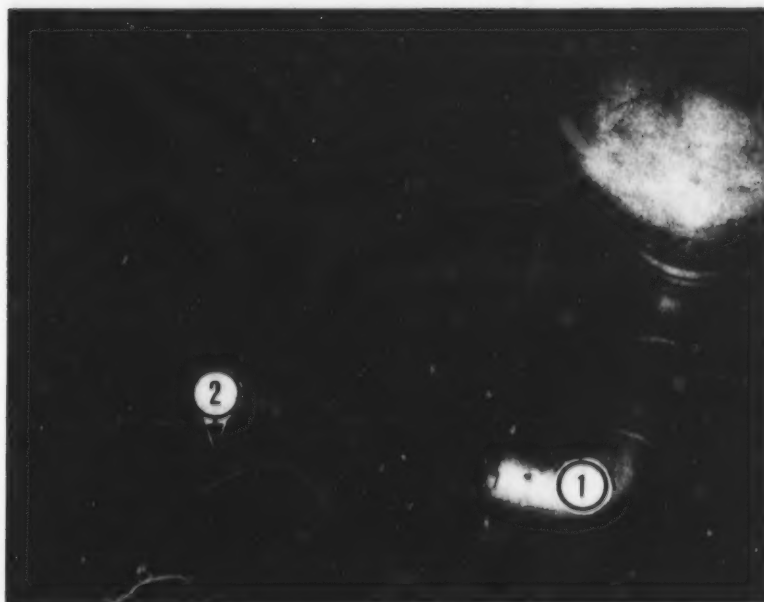
Sections of the two mooring lines by which the tug "BROCHU" was secured to the "TESTAROSSA".

Une partie des deux amarres par lesquelles le remorqueur "VACHON" était amarré au "TESTAROSSA".



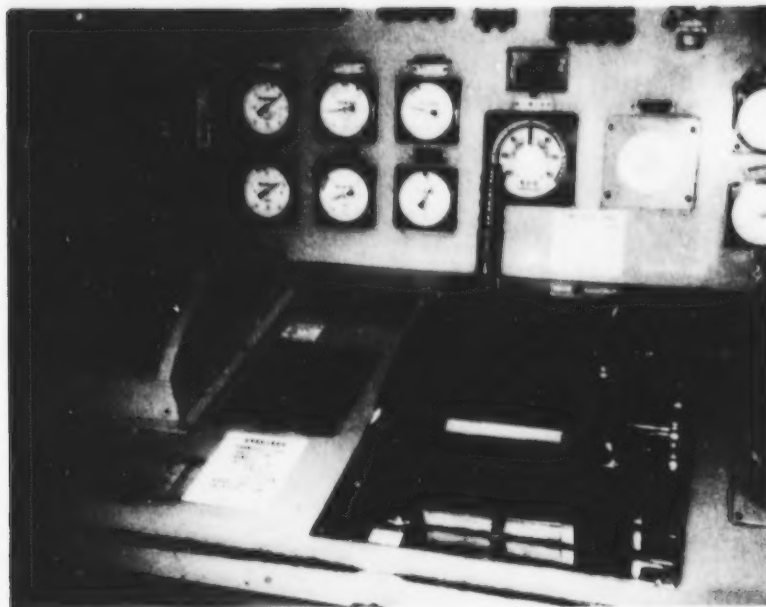
Main engine fuel heater automatic control
and by-pass valve.

Contrôle automatique de réchauffeur de combustible
pour la machine principale avec le robinet by-pass.



1. Fuel line to the heater with 2. Branch line
to the auxiliary generators.

1. Tuyau d'alimentation en combustible vers le
réchauffeur avec 2. Embranchement pour les
moteurs des génératrices auxiliaires.



Main engine controls inside the control room.
 Commande de la machine principale à l'intérieur
 de la salle des commandes.